Most efficient spectrograph to shoot the Southern skies

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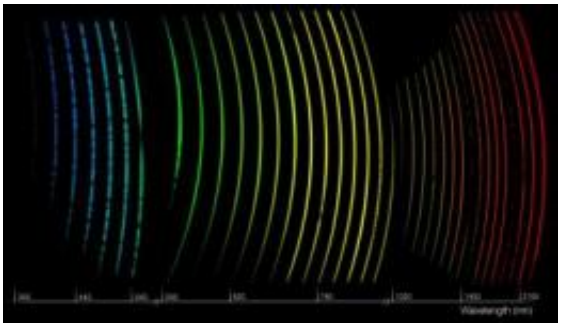

This illustration shows the three spectra produced simultaneously by the new efficient X-shooter instrument on ESO's Very Large Telescope. X-shooter can record the entire spectrum of a celestial object (in this example a distant lensed quasar) in one shot -- from the ultraviolet to the near-infrared -- with great sensitivity and spectral resolution. This unique new instrument will be particularly useful for the study of distant exploding objects called gamma-ray bursts, among the most energetic events in the Universe, which fade rapidly in brightness in matter of hours after the their appearance. The rainbow colors applied to the spectra indicate X-shooter's wide spectral coverage and are meant for illustrative purposes only. The majority of the wavelengths covered are in fact invisible to the human eye. Credit: ESO

ESO's Very Large Telescope, Europe's flagship facility for ground-based astronomy, has been equipped with the first of its second generation instruments: X-shooter. It can record the entire spectrum of a celestial object in one shot -- from the ultraviolet to the near-infrared -- with high sensitivity. This unique new instrument will be particularly useful for the

study of distant exploding objects called gamma-ray bursts.

"X-shooter offers a capability that is unique among astronomical instruments installed at large telescopes," says Sandro D'Odorico, who coordinated the Europe-wide consortium of scientists and engineers that built this remarkable instrument. "Until now, different instruments at different telescopes and multiple observations were needed to cover this kind of wavelength range, making it very difficult to compare data, which, even though from the same object, could have been taken at different times and under different sky conditions."

X-shooter collects the full spectrum from the ultraviolet (300 nm) to the near-infrared (2400 nm) in parallel, capturing up to half of all the light from an object that passes through the atmosphere and the various elements of the telescope. "All in all, X-shooter can save us a factor of three or more in terms of precious telescope time and opens a new window of opportunity for the study of many, still poorly understood, celestial sources," says D'Odorico.

The name of the 2.5-ton instrument was chosen to stress its capacity to capture data highly efficiently from a source whose nature and energy distribution are not known in advance of the observation. This property is particularly crucial in the study of gamma-ray bursts, the most energetic explosions known to occur in the Universe (ESO 17/09). Until now, a rough estimate of the distance of the target was needed, so as to know which instrument to use for a detailed study. Thanks to X-shooter, astronomers won't have to go through this first observing step. This is particularly relevant for gamma-ray bursts, which fade away very quickly and where being fast is the key to understanding the nature of these elusive cosmic sources.

"I am very confident that X-shooter will discover the most distant gamma-ray bursts in the Universe, or in other words, the first objects

that formed in the young Universe," says François Hammer, who leads the French efforts in X-shooter.

X-shooter was built by a consortium of 11 institutes in Denmark, France, Italy and the Netherlands, together with ESO. In total 68 person-years of work by engineers, technicians and astronomers and a global budget of six million Euros were required. The development time was remarkably fast for a project of this complexity, which was completed in just over five years, starting from the kick-off meeting held in December 2003.

"The success of X-shooter and its relatively short completion time are a tribute to the quality and dedication of the many people involved in the project," says Alan Moorwood, ESO Director of Programmes.

The instrument was installed at the telescope at the end of 2008 and the first observations in its full configuration were made on 14 March 2009, demonstrating that the instrument works efficiently over the full spectral range with unprecedented resolution and quality. X-shooter has already proved its full capability by obtaining the complete spectra of low metallicity stars, of X-ray binaries, of distant quasars and galaxies, of the nebulae associated with Eta Carinae and the supernova 1987A, as well as with the observation of a distant gamma-ray burst that coincidently exploded at the time of the commissioning run.

X-shooter will be offered to the astronomical community from 1 October 2009. The instrument is clearly answering a need in the scientific community as about 150 proposals were received for the first runs of X-shooter, for a total of 350 observing nights, making it the second most requested instrument at the Very Large Telescope in this period.

Source: ESO (news : web)